Nos. 22-1972, -1973, -1975, -1976

IN THE
United States Court of Appeals
FOR THE FEDERAL CIRCUIT

MASIMO CORPORATION,

Appellant,

v.

APPLE INC.,

Appellee.

APPEAL FROM THE PATENT TRIAL AND APPEAL BOARD
CASE NOS. IPR2020-01713, IPR2020-01716, IPR2020-01733, IPR2020-01737

BRIEF OF APPELLANT MASIMO CORPORATION

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December 12, 2022

Illustrative Claim of U.S. Patent No. 10,709,366

1. A noninvasive physiological parameter measurement device adapted to be worn by a wearer, the noninvasive physiological parameter measurement device comprising:

one or more light emitters;

a substrate having a surface;

a first set of photodiodes arranged on the surface and spaced apart from each other, wherein:

the first set of photodiodes comprises at least four photodiodes, and

the photodiodes of the first set of photodiodes are connected to one another in parallel to provide a first signal stream responsive to light from at least one of the one or more light emitters attenuated by body tissue;

a second set of photodiodes arranged on the surface and spaced apart from each other, wherein:

the second set of photodiodes comprises at least four photodiodes,

the photodiodes of the second set of photodiodes are connected to one another in parallel to provide a second signal stream responsive to light from at least one of the one or more light emitters attenuated by body tissue, and

at least one of the first signal stream or the second signal stream includes information usable to determine a physiological parameter of a wearer of the noninvasive physiological parameter measurement device;

a wall extending from the surface and configured to surround at least the first and second sets of photodiodes; and

a cover arranged to cover at least a portion of the surface of the substrate, wherein the cover comprises a protrusion that extends over all of the photodiodes of the first and second sets of photodiodes arranged on the surface, and wherein the cover is further configured to cover the wall.

CERTIFICATE OF INTEREST

Counsel for Appellant Masimo Corporation certifies the following:

1. The full name of every party represented by me is:

Masimo Corporation.

2. The name of the real party-in-interest represented by me is:

Masimo Corporation.

3. All parent corporations and any publicly held companies that own more than 10 percent or more of the stock of the party represented by me are:

Blackrock Inc.

4. The name of all law firms and the partners or associates that appeared for the party in the lower tribunal or are expected to appear for the party in this court and who are not listed on the docket for the current case:

Knobbe, Martens, Olson & Bear, LLP: William R. Zimmerman and Jacob L. Peterson.

5. The case titles and numbers of any case known to be pending in this court or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal:

- *Masimo Corporation v. Apple Inc.*, U.S. Court of Appeals for the Federal Circuit, Case No. 22-1631 (consolidated with Case Nos. 22-1632, 22-1633, 22-1634, 22-1635, 22-1636, 22-1637, 22-1638)

- *Masimo Corporation v. Apple Inc.*, U.S. Court of Appeals for the Federal Circuit, Case No. 22-2069 (consolidated with Case Nos. 22-2070, 22-2071, 22-2072)
- *Masimo Corporation and Cercacor Laboratories, Inc. v. Apple Inc.*, U.S. District Court for the Central District of California, Case No. 8:20-cv-00048-JVS

6. Information required under Fed. R. App. P. 26.1(b) (organizational victims in criminal cases) and 26.1(c) (bankruptcy case debtors and trustees):

Not applicable.

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OTHER AUTHORITIES

TABLE OF ABBREVIATIONS

Abbreviation	Meaning
’564 patent	U.S. Pat. No. 10,624,564
’194 patent	U.S. Pat. No. 10,702,194
’195 patent	U.S. Pat. No. 10,702,195
’366 patent	U.S. Pat. No. 10,709,366
IPR1713	IPR No. IPR2020-01713
IPR1716	IPR No. IPR2020-01716
IPR1733	IPR No. IPR2020-01733
IPR1737	IPR No. IPR2020-01737
Aizawa	U.S. Pat. App. Publ. No. 2002/0188210
Ohsaki	U.S. Pat. App. Publ. No. 2001/0056243
Mendelson-2003	“Measurement Site and Photodetector Size Considerations in Optimizing Power Consumption of a Wearable Reflectance Pulse Oximeter,” Mendelson et al., Proceedings of the 25th IEEE EMBS Annual International Conference, 2003, pp. 3016-3019
Mendelson-799	U.S. Pat. No. 6,801,799
POSITA	Person of Ordinary Skill in the Art

STATEMENT OF RELATED CASES

Pursuant to Federal Circuit Rule 47.5, Counsel is aware of the following pending cases that will be directly affected by this Court's decision in the pending appeal:

- *Masimo Corporation v. Apple Inc.*, U.S. Court of Appeals for the Federal Circuit, Case No. 22-1631 (consolidated with Case Nos. 22-1632, 22-1633, 22-1634, 22-1635, 22-1636, 22-1637, 22-1638)
- *Masimo Corporation v. Apple Inc.*, U.S. Court of Appeals for the Federal Circuit, Case No. 22-2069 (consolidated with Case Nos. 22-2070, 22-2071, 22-2072)
- *Masimo Corporation and Cercacor Laboratories, Inc., v. Apple Inc.*, 8:20-cv-00048-JVS (C.D. Cal.)

I. INTRODUCTION

This appeal addresses four patents, four IPRs, and repeated mistakes by the Board. The Board's errors led it to invalidate numerous claims directed to Masimo's innovative optical sensors for noninvasively measuring the constituents of a person's blood.

Inventor Joe Kiani founded Masimo as a garage start-up in 1989 to improve devices for measuring oxygen saturation of blood. Masimo revolutionized technology for noninvasively measuring oxygen saturation, becoming the leading supplier worldwide. Over the years, Masimo also developed revolutionary technology for noninvasively measuring difficult and previously unattainable blood constituents. Today, Masimo's products are used yearly on over two-hundred million patients to noninvasively measure many blood constituents.

The Masimo patents at issue here arose from a search for improvements to the signal strength of noninvasive optical sensors to enable measurement of previously unmeasurable blood constituents, such as carbon monoxide, methemoglobin, total hemoglobin, and blood glucose. Noninvasive physiological optical sensors emit light into skin tissue and detect that light after passing through the tissue. Through extensive research and innovation, the inventors discovered that certain structural features surprisingly worked together to increase signal strength by an order of magnitude. In addition, although conventional wisdom taught to combine all

detected signals into one signal stream, the inventors discovered that separating signal streams from different parallel-connected photodiodes increased signal diversity and improved signal-to-noise ratio. Those innovations, among others, help a sensor extract the information needed for successfully determining hard-to-measure analytes.

No prior art discloses Masimo's innovative approach, including a physiological sensor with a convex cover positioned over multiple detectors (much less combined with the other claimed features). Nor does the prior art suggest utilizing individual signal streams from different groups of parallel-connected detectors. Instead, the prior art teaches the benefits of monitoring one signal stream. The inventors' discoveries contradicted conventional wisdom, as taught in the very prior art relied upon by Apple. The petitions attempted to recreate Masimo's claims by combining disparate features from different references that actually discourage the combinations. But even small structural changes to a physiological optical sensor may have significant consequences on the weak signal that is monitored.

The Board nonetheless accepted the petitions' proposed dramatic changes to prior art sensors, with no motivation to do so coming from the references. To address the claim requirement of two separate sets of photodiodes, each producing its own signal stream, the Board speculated that a POSITA would have reorganized a sensor's single ring of detectors by moving some detectors to a new, separate far

ring. The Board found this modification would increase signal strength and reduce power consumption. But the prior art teaches the opposite—that detectors in a far ring receive less light, resulting in reduced signal strength and increased power consumption for a sensor. The Board erred by ignoring Apple's expert's admissions that confirm a POSITA would have arranged detectors in a single ring close to the light source to increase signal strength. Both the prior art and Apple's expert confirm the Board's erroneous analysis.

The Board also disregarded the express teachings within the four corners of the cited art in favor of hindsight-driven opinions from Apple's expert. For example, the Board found a POSITA would have been motivated to convert a sensor's surface, which the prior art disclosed and taught should be flat, to a convex surface to supposedly increase "light detection." But the references relied on by the Board taught that a flat surface improves light detection. Moreover, those references, and thus the Board's resulting combinations, placed detectors at the sensor's ***periphery***. Apple and its expert repeatedly admitted that a convex surface condenses light toward the sensor's ***center*** and thus ***away*** from the periphery. Thus, far from increasing light detection, a POSITA would have expected the combinations' convex surface to ***decrease*** light detection—the exact opposite of the Board's motivation to combine.

After Apple filed its petitions, and Masimo exposed this fundamental flaw in Apple's combinations, Apple changed course and contradicted its initial position, expert declarations, and expert deposition testimony. Apple asserted an assortment of new and unsupported theories that allegedly showed the combinations would supposedly increase light at peripheral detectors.

The Board erred by not reconciling Apple's numerous initial positions and admissions in its analysis. Instead, the Board adopted one of Apple's new theories on reply—that a convex surface would capture more light overall than a flat surface. But the Board made no attempt to reconcile that theory with Apple's original theory and numerous admissions.

The Board also found a POSITA would have been motivated to add a convex surface to improve "adhesion" to a user's skin. The Board concluded that a POSITA would have been motivated to add a convex surface to a prior-art sensor worn on the wrist's palm-side. But the references relied on by the Board taught the exact opposite. Specifically, (1) one reference taught a convex surface slips on the palm-side; and (2) the other taught a flat surface improves adhesion on the palm-side. The Board's finding contradicted the express disclosures of ***both*** references. The Board erred by failing to reconcile the express disclosures that undermine its finding.

Over the years, Masimo has developed a range of technologies that revolutionized the field of noninvasive monitoring. *See Mallinckrodt, Inc. v.*

Masimo Corp., 147 F. App'x 158, 163 (Fed. Cir. 2005) (nonprecedential); *Masimo Corp. v. Philips Elec. N. Amer. Corp.*, 2015 WL 2379485, at *1 (D. Del. May 18, 2015). Masimo's various patents over the years have withstood extensive litigation and are recognized by the industry and courts as fundamental innovations. *Id*.

PTAB decisions, however, have now invalidated hundreds of claims in dozens of Masimo patents across many patent families.[1] The consistent thread across those decisions is a willingness to disregard the four corners of the references and rely on unsupported speculation and hindsight reconstruction. The Board errors at issue here led the Board to invalidate 104 Masimo claims. The Board's decisions are profoundly flawed and unsupported by substantial evidence. This Court should reverse those decisions.

[1] To date, the Board has also invalidated Masimo claims in IPR2021-00209, IPR2021-00208, IPR2021-00195, IPR2021-00193, IPR2020-01722, IPR2020-01715, IPR2020-01714, IPR2020-01539, IPR2020-01538, IPR2020-01537, IPR2020-01536, IPR2020-01526, IPR2020-01521, IPR2020-01520, IPR2020-01078, IPR2020-01054, IPR2020-01033, IPR2020-01019, IPR2020-01015, IPR2020-00967, IPR2020-00954, IPR2020-00912.

II. JURISDICTIONAL STATEMENT

The Board issued final written decisions in IPR1713 on May 2, 2022, in IPR1716/1733 on April 28, 2022, and in IPR1737 on May 4, 2022. Appx00001-00075; Appx00076-00157; Appx00158-00232; Appx00233-00309. Masimo timely appealed these decisions on June 28, 2022. Appx01193-01195; Appx07941-07943; Appx15380-15382; Appx21326-21328. The Court has jurisdiction under 35 U.S.C. §§ 141(c), 319 and 28 U.S.C. § 1295(a)(4)(A).

III. STATEMENT OF THE ISSUES

1. Did the Board err by failing to reconcile in its analysis key prior art disclosures and admissions by Apple and its expert that undermine the Board's findings, resulting in unpatentability decisions unsupported by substantial evidence?

2. Did the Board err by (1) relying on arguments the Board itself raised without providing Masimo the opportunity to respond and (2) relying on the Board's own interpretations and theories unsupported by the record?

IV. STATEMENT OF THE CASE

A. Masimo's Claimed Inventions

The patents at issue arose from efforts to measure previously unmeasurable blood constituents through Masimo's Rainbow® technology. As the shared patent specification explains, the inventions are directed to noninvasive optical devices for "measuring a blood constituent or analyte, such as oxygen, carbon monoxide, methemoglobin, total hemoglobin," as well as "many other physiologically relevant patient characteristics." Appx00389 2:38-44.[2]

To detect parameters that are difficult to monitor optically and noninvasively, the inventors had to explore unconventional approaches. The inventors' research and development included thousands of hours of analysis, design, and experimentation, which culminated in unanticipated results and novel sensor structures.

The industry conventionally believed that pressure at the measurement site problematically displaced the desirable blood from the measurement site. *See*, *e.g.*, Appx10242 3:27-67. The inventors through experimentation found that a protrusion which applied pressure could—together with other unique features—provide signal improvement benefits. Those signal improvement benefits outweigh the drawbacks

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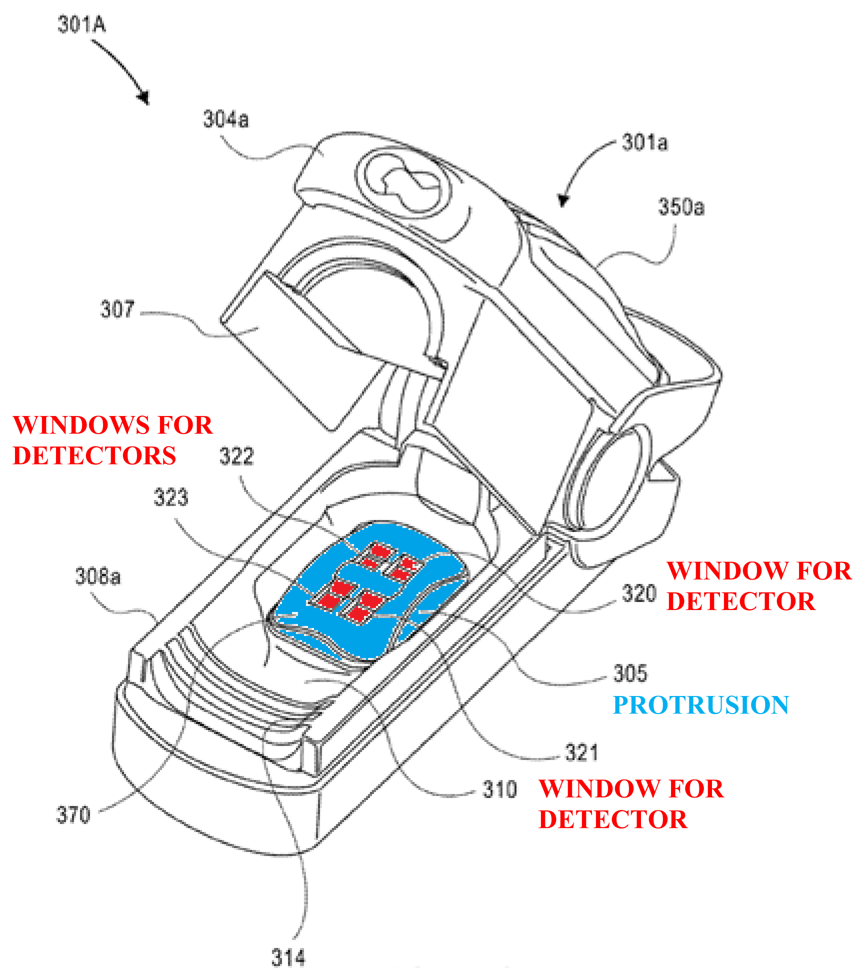
[2] Masimo provides representative citations to the '564 patent in view of the shared patent specification unless otherwise noted.

of pressure and allow for measurement of blood constituents that are challenging to detect.

Masimo's Figure 3C (below) from the shared patent specification illustrates many features of such a device (301A), including a protrusion (305) and windows (320/321/322/323) for four detectors. Appx00331; Appx00398 19:38-48.

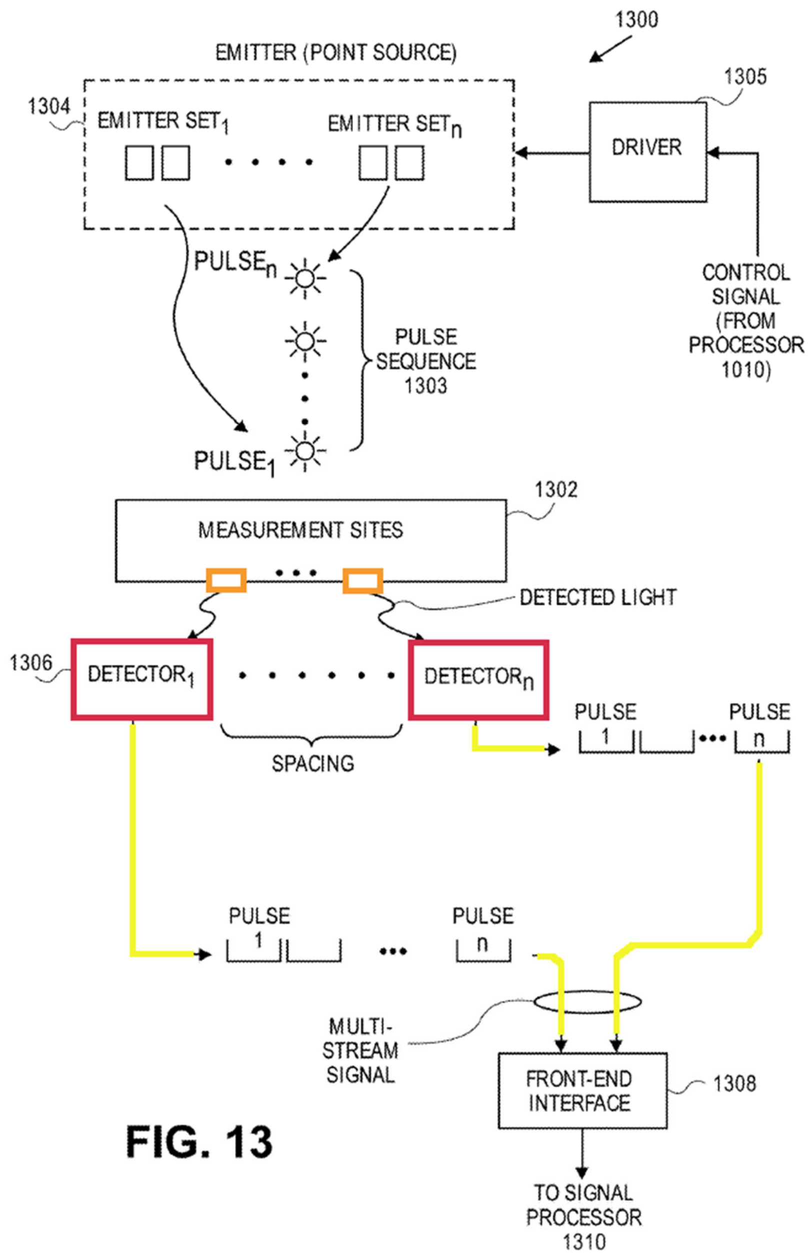


Masimo Patent Sensor Illustration Fig. 3C (color added, Appx00331)

Masimo's specification explains that the protruding surface thins out the measurement site, resulting in less light attenuation by the measured tissue. Appx00392 7:58-61. The protruding surface further increases the area from

which attenuated light can be measured. *Id*. 7:61-63. The multiple detectors allow for an averaging of measurements, which can reduce errors due to variations in the path of light passing through the tissue. Appx00393 9:28-33; *see also* Appx00390 3:22-32, 4:25-35. The patents explain that positioning the detectors "beneath the protrusion" (including under windows in certain embodiments) can reduce the "mean optical path length from the emitters to the detectors" such that the "accuracy of blood analyte measurement can increase." Appx00398 20:25-29.

For particularly hard-to-measure analytes, the inventors discovered that multiple signal "streams" could improve the signal-to-noise ratio. Appx00405 34:33-36. The inventors also found that multiple signal streams from multiple detectors sets spaced apart from each other sampled different light paths through the tissue, which allowed noise cancellation. Appx00406 35:8-34. Figure 13 (below) generally illustrates the inventive multi-stream process.



Masimo Patent Sensor Illustration Fig. 13 (color added, Appx00357)

As shown in Figure 13, each photodiode set (red above) measures light from the measurement site (orange above) and outputs a separate signal stream (yellow above). Appx00405 33:27-33. The spatial array positions the photodiode sets at different locations. *Id.* 34:36-38. As a result, each photodiode set monitors a

different mean path length of light traveling through tissue. Appx00406 35:23-25; *see also* Appx00404 32:16-19. The signal processor analyzes the signal streams, measured at each individual time, increasing signal diversity. Appx00405-00406 34:63-35:34.

The spatial geometry and diversity of path lengths among the photodiode sets "allows for multiple bulk and pulsatile measurements that are robust." Appx00393 9:19-22. The inventors discovered that when there is a sufficient difference in mean path length between the photodiodes, connecting the photodiodes in parallel leads to signal averaging and noise cancellation and reduction. *Id*. 9:30-33. In contrast, the conventional approach simplified calculations by assuming a constant and fixed path length that results in a single-stream sensor. Appx00405 34:15-22. The inventors rejected conventional wisdom and instead used different path lengths through tissue to their advantage. The inventors discovered that the separate signal streams provided by different sets of parallel-connected photodiodes could validate measurements and improve signal-to-noise ratio. *Id*. 34:29-36. In fact, the signal-to-noise ratio improved to the point where it became possible to measure particularly challenging analytes, such as blood glucose. *Id*. The inventors' separate signal stream design allowed an innovative analytical approach that used the separate signal streams and different mean path lengths to cancel out noise and differentiate the analyte signal from confounding signals. Appx00406 35:8-44. The noise

reduction from the inventors' approach "can be several times greater in magnitude" than that "achievable by currently available technology." Appx00405 34:59-62.

The inventors discovered that these different features work together to provide greater noise cancellation and increase signal strength. Appx00393 9:28-33; Appx00398 20:25-42; *see also* Appx00390 3:22-32, 4:25-35. None of the prior art provides these teachings. The inventors even identified specific beneficial protrusion heights, explaining that a "convex bump of about 1 mm to about 3 mm in height" was found to "help signal strength by about an order of magnitude versus other shapes." Appx00398 20:29-33.

During prosecution, the examiners agreed the claimed combinations were a patentable advance unique in the field and "the prior art of record does not teach or suggest" Masimo's claims. Appx01960-01962; Appx08349-08352; Appx15781-15784; *see also* Appx21843. No reference asserted in the IPRs discloses a physiological sensor with a convex cover positioned over multiple detectors (much less combined with the other claimed features).

All four patents share the same comprehensive specification and the same July 2008 priority date. Appx00310-00412; Appx00413-00516; Appx00517-00620; Appx00621-00724. The patent specification includes more than sixty pages of figures and twenty pages of detailed disclosure. *Id*. Given the extensive disclosure,

Masimo unsurprisingly obtained a number of different claims directed to various disclosed features.

For example, while all patents claim aspects of a system or method that includes multiple detectors underneath a cover with a protrusion, the ’194, ’195, and ’366 patents further claim multiple signal streams from different sets of parallel-connected photodiodes. Appx00514-00516; Appx00618-00620; Appx00721-00724. The signal streams and parallel connections may improve signal-to-noise ratio and facilitate noise cancellation, allowing measurement of different and difficult-to-measure blood constituents. Appx00394-00395 12:5-13:47.

The ’564, ’194, ’195, and ’366 patents also claim a wall that surrounds or circumscribes the at least four detectors or photodiodes. Appx00310-00412; Appx00413-00516; Appx00517-00620; Appx00621-00724. The wall may control a positioning of the protrusion with respect to the detectors or photodiodes, enabling improved detection. Appx00406 36:45-51.

The ’564, ’194, and ’195 patents claim specific protrusion height ranges disclosed by the inventors in the specification as providing greater noise cancellation and an order of magnitude increase in signal strength. Appx00310-00412; Appx00413-00516; Appx00517-00620.

Claim 1 of the ’366 patent illustrates features common to the claims:

1. A noninvasive physiological parameter measurement device adapted to be worn by a wearer, the noninvasive physiological parameter measurement device comprising:

one or more light emitters;

a substrate having a surface;

a first set of photodiodes arranged on the surface and spaced apart from each other, wherein:

the first set of photodiodes comprises at least four photodiodes, and

the photodiodes of the first set of photodiodes are connected to one another in parallel to provide a first signal stream responsive to light from at least one of the one or more light emitters attenuated by body tissue;

a second set of photodiodes arranged on the surface and spaced apart from each other, wherein:

the second set of photodiodes comprises at least four photodiodes,

the photodiodes of the second set of photodiodes are connected to one another in parallel to provide a second signal

stream responsive to light from at least one of the one or more light emitters attenuated by body tissue, and

at least one of the first signal stream or the second signal stream includes information usable to determine a physiological parameter of a wearer of the noninvasive physiological parameter measurement device;

a wall extending from the surface and configured to surround at least the first and second sets of photodiodes; and

a cover arranged to cover at least a portion of the surface of the substrate, wherein ***the cover comprises a protrusion that extends over all of the photodiodes of the first and second sets of photodiodes arranged on the surface***, and wherein the cover is further configured to cover the wall.[3]

B. <u>The Board's Prior Art Combinations</u>

The Board combined elements of one primary reference (Aizawa (Appx02488-02494)) with elements of at least one of two secondary references (Mendelson-2003 (Appx10229-10232) or Ohsaki (Appx02542-02547)).[4]

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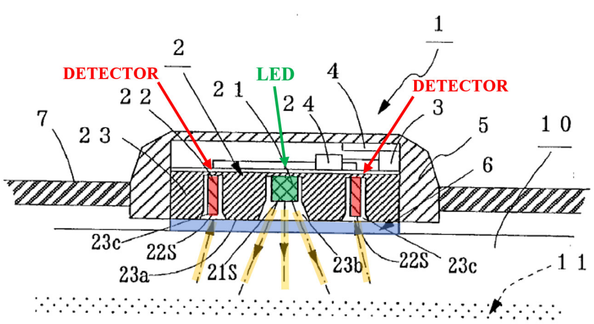
[3] Emphasis supplied unless otherwise noted.

[4] Masimo provides representative citations to exhibits in view of common exhibits across IPRs unless otherwise noted.

1. <u>Aizawa And Mendelson-2003 (IPR1716/1733/1737)</u>

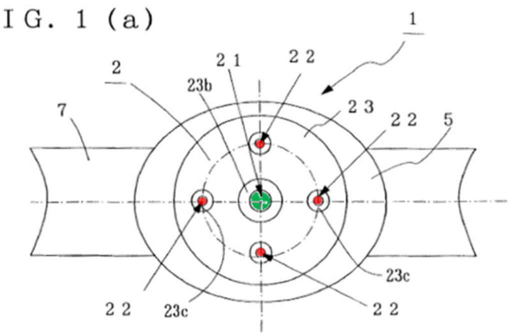
Three Board decisions combined Aizawa with Mendelson-2003 to invalidate claims of the ’194, ’195, and ’366 patents. Appx00155; Appx00230; Appx00307.

Aizawa discloses a wrist-worn sensor (below) for detecting a pulse. Appx02488-02489 Abstract, Figs. 1A-1B. Aizawa’s sensor includes peripheral detectors (red below) in a single concentric circle around one centrally located LED (green below). Appx02493 ¶¶[0023], [0026]. The sensor includes one narrow tapered opening over each detector to collect light reflected from arteries and uses multiple openings/detectors to ensure at least one detector is near an artery during monitoring. *Id.* ¶¶[0022]-[0027].



Aizawa Fig. 1B
(color added, Appx02489)

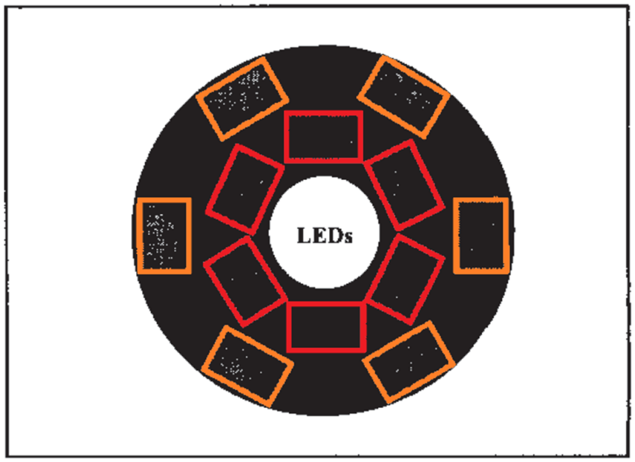
FIG. 1 (a)



Aizawa Fig. 1A
(color added, Appx02489)

In contrast to Aizawa’s sensor, Mendelson-2003 discloses a laboratory testing system constructed to study the impact of widening the overall detection area. Appx10230. Mendelson-2003’s system uses two rings of detectors—one near “inner” ring (red below) and one far “outer” ring (orange below)—to “investigate

the power savings achieved by widening the overall active area of the PD [photodetector]…." *Id*.



Mendelson-2003 Fig. 1 (color added, *Id*.)

Mendelson-2003 explains its "[e]xperimental setup": "six PDs were positioned in a close inner-ring configuration at a radial distance of 6.0mm from the LEDs. The second set of six PDs spaced equally along an outer-ring, separated from the LEDs by a radius of 10.0mm." *Id*. Each set of photodetectors "were wired in parallel and connected through a central hub to the common summing input of a current-to-voltage converter." *Id*. Mendelson-2003 uses its detector configuration to compare the signal difference for different sets of detectors at different locations. *Id*. Mendelson-2003 determined that a far detector ring requires significantly more power to obtain a similar signal as compared to a near detector ring. *Id*.

Mendelson-2003 illustrates its experimental results in Figure 4 (below). Appx10231.

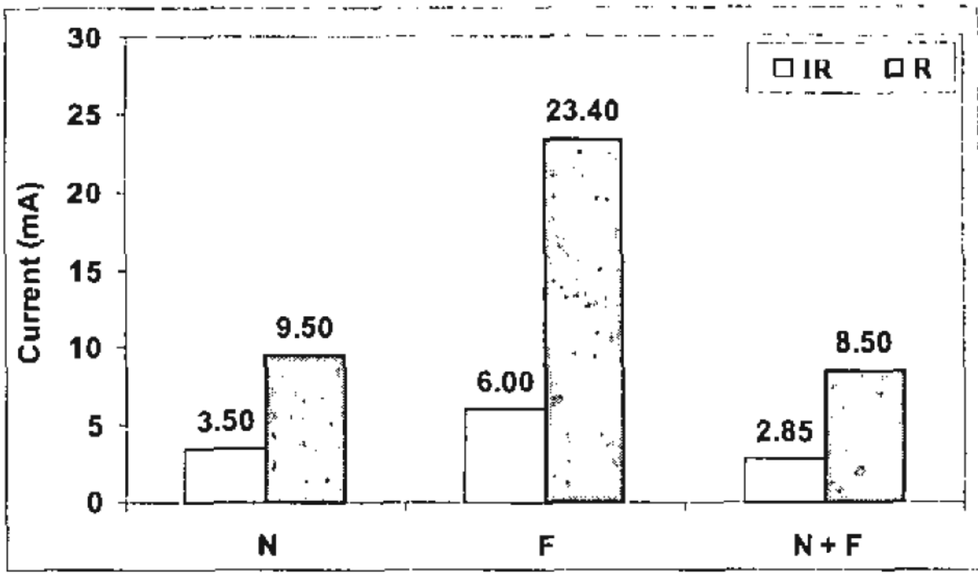


Fig. 4. Relative LED peak driving currents required to maintain a constant PPG amplitude of 0.840V RMS for the near (N), far (F) and combination (N+F) PD configurations. Measurements were obtained from the forehead.

Figure 4 plots the LED drive current needed to maintain a constant detected signal amplitude. *Id.* As measured, the six near (N) detectors require the LEDs to be driven at a much lower current to achieve the same signal strength, compared to the six far (F) detectors. Appx10231-10232. Mendelson-2003 explains that "[t]his observation was expected since the backscattered light intensity measured is inversely related to the separation distance between the PD and the LEDs." Appx10232.

Mendelson-2003 does not teach that the separately connected detector rings can be used or have any benefit in a sensor for physiological monitoring. To the contrary, after analyzing the test data indicating relative power consumption, Mendelson-2003 concluded that there was a benefit to "combining both PD sets to simulate ***a single large PD area***." *Id.* Mendelson-2003 noted the "practical

advantage gained by using a reflection sensor comprising a large ring-shaped PD area" and recommended "employing a wide annular [ring-shaped] PD." *Id.*; *see also* Appx10229 (recommending "employing a wide annularly shaped photodetector ring configuration"). Mendelson himself used the recommended approach of one large photodetector, producing one signal stream, "to reduce power consumption" in his sensor designs for a "wearable, reflectance pulse oximeter." Appx02551; *see also* Appx02548-02550 (Fig. 2, illustrating path for one signal stream from photodetector).

The Board's combination changes Aizawa's single ring of detectors into two rings of detectors, including a new far ring. Appx00108-00109; Appx00189-00190; Appx00265-00266. The Board cited Apple's below illustration as showing the proposed combination.

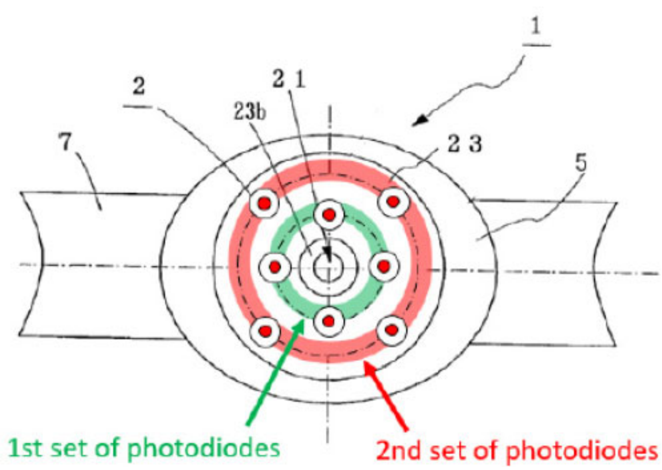


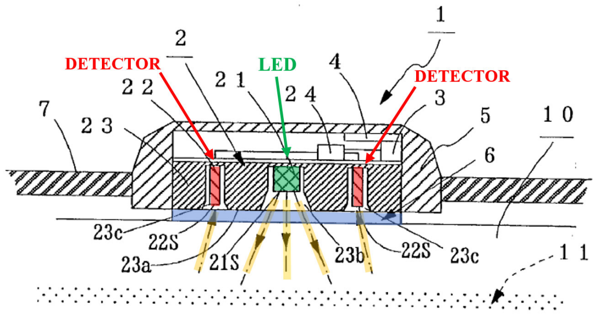
Illustration of Aizawa-Mendelson-2003 Combination (Appx00100; Appx000181; Appx00257)

The Board reasoned that introducing the new far ring of detectors increases signal strength. *Id*. Mendeslon-2003, however, explains that positioning a detector farther from a light source decreases light collection. Appx10231-10232. The Board's combination also connects the detectors of each individual ring in parallel but does not connect all detectors in parallel. Appx00108-00109; Appx00189-00190; Appx00265-00266. Mendelson-2003, in contrast, recommends that all detectors be connected in parallel in a sensor for physiological monitoring. Appx10232.

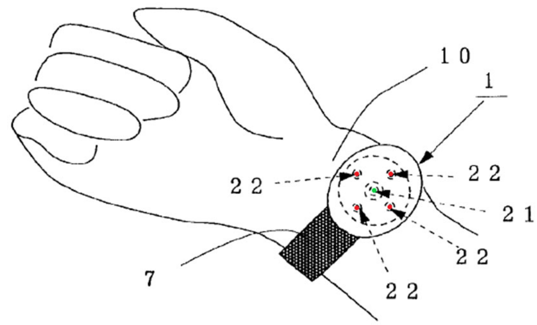
2. Aizawa And Ohsaki (IPR1713/1716/1733/1737)

Four Board decisions combined Aizawa with Ohsaki to invalidate claims of the '564, '194, '195, and '366 patents. Appx00073; Appx00155; Appx00230; Appx00307.

As discussed, Aizawa discloses a sensor for detecting a pulse. *See supra* Section IV.B.1. Aizawa's circular sensor (below) is worn on the wrist's palm-side and includes a "transparent plate-like member" (blue below) over four peripheral detectors (red below) around one centrally located LED (green below). Appx02493 ¶¶[0023], [0026].



Aizawa Fig. 1B
(color added, Appx02489)

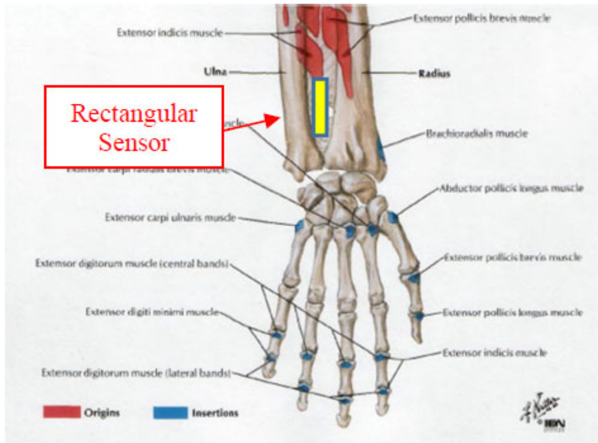


Aizawa Fig. 2
(color added, Appx02490)

Aizawa discloses that its ***flat*** "plate-like member" is what "makes it possible to improve adhesion between the sensor and the wrist and thereby further improve the detection efficiency of pulse waves." Appx02492 ¶[0013].

Unlike Aizawa's ***palm-side*** sensor, Ohsaki discloses a sensor that "is worn on the ***back side*** [i.e., watch side] of a user's wrist corresponding to the back of the user's hand." Appx02542 Abstract. Ohsaki explains that its cover or "board" prevents slipping on the wrist's backside, but if placed on the wrist's palm-side (at Aizawa's measuring location), it "has a tendency to ***slip off*** the detecting position." Appx02546 ¶¶[0023]-[0024]; Appx02544 Figs. 3A-3B.

Masimo presented unrebutted expert testimony explaining how, based on Ohsaki's disclosure, Ohsaki's longitudinal structure reduces slipping by fitting within an anatomical opening on the backside of the user's wrist. Appx05313-05317 ¶¶46-50; Appx12906-12910 ¶¶53-57; Appx18855-18859 ¶¶53-57; Appx24659-24663 ¶¶53-57. Masimo's expert explained, with supporting evidence, how such a longitudinal structure anchors itself in an opening between two bones (*id.*):



Masimo's Expert's Anatomical Drawing

The Board's combination required a POSITA to change Ohsaki's longitudinal board to a circular cover to match Aizawa's sensor, eliminating the longitudinality that Ohsaki expressly explains is important to reduce slipping. Appx02546 ¶[0019]. The Board's combination also required a POSITA to place Ohsaki's convex surface on the wrist's palm-side, which Ohsaki taught would slip off, ignoring that Aizawa says to use a flat plate at its palm-side location. Appx05334-05335 ¶76; Appx12927-12928 ¶83; Appx18876-18877 ¶83; Appx24680-24681 ¶83.

The Board's combination also placed a protrusion over peripheral detectors. Appx05338 ¶79; Appx12930-12931 ¶86; Appx18879-18880 ¶86; Appx24683-24684 ¶86. Apple and its expert repeatedly admitted that the convex surface in such a combination would concentrate light centrally and thus away from peripherally located detectors. Appx06387; Appx06525-06527 ¶¶118-120; Appx05465-05466 83:15-84:2; Appx05468-05469 86:19-87:1. Moreover, the Board's combination

contradicts Aizawa's express teaching to use a flat plate for improved detection efficiency. Appx02492 ¶[0013].

V. SUMMARY OF THE ARGUMENT

1. In IPR1716/1733/1737, the Board found a POSITA would have modified Aizawa's single ring of detectors by creating a new far ring of detectors to increase signal strength and reduce power consumption. But the prior art and Apple's expert's admissions confirm that moving detectors farther from a light source, as the Board proposed, decreases signal strength and increases power consumption. The Board also found a POSITA would have connected the detectors of the far ring in parallel with one another but not in parallel with the detectors of an inner ring. In making this finding, the Board did not reconcile Apple's expert's admissions, the teachings in the prior art, and the Board's own findings about the capabilities of Aizawa's sensor.

2. In IPR1713/1716/1733/1737, the Board found a POSITA would have added a convex surface to a flat sensor surface to improve "detection efficiency" and "adhesion" when the prior art, Apple's admissions, and evidence established the opposite. The Board additionally found specific claimed protrusion height ranges obvious though none of references in the Board's combinations disclosed or suggested such ranges.

VI. STANDARD OF REVIEW

The Board's "determination of obviousness under § 103 is a question of law." *SightSound Techs., LLC v. Apple Inc.*, 809 F.3d 1307, 1318 (Fed. Cir. 2015). The Board's factual findings are reviewed for substantial evidence and its legal conclusions are reviewed de novo. *Id.*

VII. ARGUMENT

A. The Board Made Multiple Errors In Finding A POSITA Would Have Been Motivated To Change Aizawa's Single Ring Of Detectors Into Two Separate Rings Of Detectors Connected In Parallel

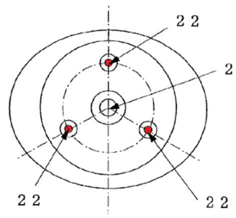
The Board found in IPR1716/1733/1737 that a POSITA would have modified Aizawa's sensor, which includes multiple detectors in a single ring near a centrally located emitter. Appx00107-00108; Appx00188-00189; Appx00264-00265. The Board found that a POSITA would (1) position some of Aizawa's detectors away from the centrally located emitter to form a far ring of detectors and (2) connect the detectors of the far ring in parallel with one another but not in parallel with the detectors of a near ring of detectors. Appx00108-00109; Appx00189-00190; Appx00265-00266. The Board's findings ignore Mendelson-2003's teachings, are contrary to the operation of Aizawa's sensor, ignore the actual changes to Aizawa's sensor proposed by the petition, and are never reconciled with Apple's expert's admissions. The Board's modifications decrease signal strength and increase power consumption without any benefits. The Board's findings are unsupported by substantial evidence.

1. Substantial Evidence Does Not Support The Board's Finding That Mendelson-2003 Would Have Motivated A POSITA To Modify Aizawa's Sensor To Create A Far Ring of Detectors

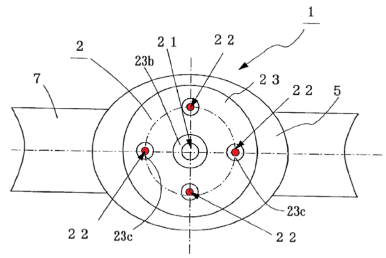
The Board found that Mendelson-2003 would have motivated a POSITA to modify Aizawa's "single ring [of detectors] around central emitter 21" to "include a second set of detectors." Appx00107-00108; Appx00188-00189; Appx00264-00265. The Board's obviousness analysis is contrary to the explicit teachings of Mendelson-2003 and Aizawa.

The Board found that positioning the second set of detectors in a far ring would increase signal strength and thus improve battery life. *Id*. Mendelson-2003, however, teaches that positioning detectors farther from a central emitter ***reduces*** signal strength and increases power consumption. Appx10231-10232. The Board's finding that a POSITA would have moved detectors away from Aizawa's single ring and into a new far ring is unsupported by substantial evidence.

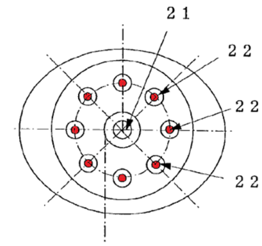
The Board fundamentally misunderstood Mendelson-2003's teachings and the impact of the Board's proposed alteration to Aizawa's detector arrangement. As illustrated below, Aizawa discloses different sensor designs that each have multiple detectors (red below) in a single concentric ring. Appx02489 Fig. 1A; Appx02491 Figs. 4A-4B.



Aizawa Fig. 4B (color added) (Appx02491)



Aizawa Fig. 1A (color added) (Appx02489)



Aizawa Fig. 4A (color added) (Appx02491)

Aizawa explains that adding detectors to its single-ring "improve[s] detection efficiency." Appx02493 ¶[0032]. The Board, however, found that Mendelson-2003 "plainly suggests" that placing four of Aizawa's detectors in a ***separate*** far ring "would result in a power savings over a single ring." Appx00112-00113; Appx00194; Appx00269-00270.

Mendelson-2003 does not support the Board's finding. To the contrary, Mendelson-2003 expressly teaches that arranging detectors farther from the centrally located emitter results in a weaker detected signal and requires correspondingly more power. Appx10231-10232. Mendelson-2003 explains that "significantly higher currents are required to drive the LEDs when backscattered light is measured by the outer PD set compared to the inner set." Appx10232. Mendelson-2003 further explains that "[t]his observation was expected since the backscattered light intensity measured is inversely related to the separation distance between the PD and the LEDs." *Id*. The Board's finding "that the proposed modification" of moving some of Aizawa's detectors to a far ring "would result in a

power savings over a single ring" directly conflicts with Mendelson-2003's teachings. The Board's finding additionally conflicts with Aizawa's teaching that adding detectors to the existing single-ring structure "improve[s] detection efficiency." Appx02493 ¶[0032].

The Board also found that Aizawa "does not limit the increase in photodetectors to being included in only the existing single ring of detectors." Appx00113; Appx00194; Appx00270. But a POSITA would not make the Board's proposed change because it ***decreases*** the received signal, ***increases*** the required LED drive current, and thus results in ***worse*** performance compared to Aizawa's existing single-ring detector arrangement. Nor is the Board's finding that Aizawa "does not limit" itself to a single ring of detectors supported by substantial evidence. Aizawa teaches that its detectors should be "disposed around the light emitting diode 21 symmetrically on ***a circle*** concentric to the light emitting diode." Appx02493 ¶[0023]; *see also id.* ¶¶[0027], [0029], [0032]; Appx02488 Abstract. Regardless of whether Aizawa's detector arrangement "is not limited," Aizawa explains: "it is ***desired*** that the photodetectors 22 should be disposed around the light emitting diode 21 on ***a circle*** concentric to the light emitting diode 21." Appx02493 ¶[0032]; Appx02489 Fig. 1A; Appx02491 Figs. 4A-4B. In contrast, Mendelson-2003's system includes two rings of detectors because its large detectors do not fit in a single ring, which is ***not*** an issue for Aizawa's design that uses small detectors.

Appx12947-12948 ¶108; Appx12936-12937 ¶94; Appx18896-18897 ¶108; Appx18885-18886 ¶94; Appx24700-24701 ¶108; Appx24689-24690 ¶94.

The Board's combination requires unnecessarily and detrimentally separating Aizawa's detectors into a far ring. Substantial evidence does not support such a modification. This error alone undermines all of the Board's obviousness determinations and justifies reversal.

2. **The Board Erred By Ignoring Apple's Expert's Admission That A POSITA Motivated To Reduce Power Consumption Would Have Arranged Detectors In A Near Ring, Not A Far Ring As The Board Found**

The Board also erred by ignoring admissions from Apple's expert and instead adopting Apple's expert's conclusory declaration testimony. Apple's expert testified that a POSITA motivated by the desire for better power consumption would have moved Aizawa's detectors ***closer*** to the centrally located emitter, not farther from the emitter as the Board found. Appx14298-14299 100:6-101:6. Apple's expert's testimony undermines the Board's findings.

The Board relied on a single paragraph from Apple's expert's declaration as evidence that moving some of Aizawa's detectors away from the centrally located emitter "would have led to predictable results without significantly altering or hindering the functions performed by Aizawa's sensor." Appx00108 (quoting Appx08516-08517 ¶74); Appx00189 (quoting Appx15940-15941 ¶76); Appx00265 (quoting Appx21979 ¶75). The cited declaration is conclusory and conflicts with

Mendelson-2003's teachings. EX1003 ¶74. Conclusory expert testimony that conflicts with the reference's teachings cannot support obviousness. *TQ Delta, LLC v. Cisco Sys., Inc.,* 942 F.3d 1352, 1362 (Fed. Cir. 2019).

Indeed, Apple's expert agreed that a POSITA motivated to reduce power consumption would place detectors closer to Aizawa's emitter at the sensor's center. Apple's expert explained: if the goal was "to produce the same likely waveform and do that with a ***reduction in the power*** from the LEDs, and you had room to put detectors into the system, I think we know from the discussion we've already had today, that there's more signal available in the region ***close*** to the center versus out at the end." Appx14298-14299 100:6-101:6. Apple's expert also confirmed—consistent with Mendelson-2003's teachings—that a far ring of detectors receive less signal. Appx14257-14258 59:14-60:7; Appx14310 112:3-16. The Board did not reconcile these admissions, which undermine the Board's findings that positioning some of Aizawa's detectors in a far ring would increase signal strength and "result in a power savings over a single ring." *See supra* Section VII.A.1. Apple's expert's admissions establish the opposite.

3. Substantial Evidence Does Not Support The Board's Finding That A POSITA Would Have Incorporated Two Separate Rings Of Parallel-Connected Detectors In Aizawa's Sensor

The Board found that there were "numerous advantages associated [with] the parallel connections taught by Mendelson-2003, such as monitoring for

displacement, accounting for motion artifacts, and compensating for the relative decrease in light that reaches the outer ring, which cannot be achieved with a single signal stream." Appx00108-00109 (citing Appx08530-08533 ¶¶95-97); Appx00190 (citing Appx15963-15965 ¶¶107-109); Appx00265-00266 (citing Appx21998-22003 ¶¶101-106). But none of these alleged advantages are supported by substantial evidence, and Apple's expert admitted that his analysis of these benefits was flawed. The Board also did not reconcile its findings with Apple's expert's testimony admitting the flaw in his analysis. The Board's errors undermine its motivation findings and are an independent reason for reversal.

The Board cited a handful of paragraphs from Apple's expert declaration in support of its finding of "numerous advantages." *Id.* But neither Aizawa nor Mendelson-2003 identifies any of these alleged "numerous advantages." Instead, Apple's expert relied on a different reference, Mendelson-799 (Appx10233-10248). Appx08530-08531 ¶95; Appx15963 ¶107; Appx22000-22001 ¶104. Apple's expert argued that Mendelson-799's sensor achieves the identified benefits "by maintaining separate streams coming from each of its inner and outer rings of photodetectors." *Id.* (citing Appx10247 13:31-42).

Mendelson-799's sensor, however, does ***not*** monitor separate streams from parallel-connected detectors. Instead, Mendelson-799's sensor uses individual signals from individual photodetectors. *See* Appx10246-10247 12:37-13:7

(measurements "obtained from each of the discrete photodiodes individually," and system can "selectively disregard" individual photodiode readings). Mendelson-799 actually warns against "summing the individual intensities of each photodetector and using the resulting value" because it "can introduce large errors." Appx10246 12:39-44. Apple's expert admitted that Mendelson-799's benefits required monitoring signals from individual detectors, not parallel-connected detectors. Appx14315-14316 117:15-118:15 (admitting Mendelson-799's photodetectors are not connected in parallel); Appx14318-14319 120:17-121:16 (Mendelson-799's benefits require individual photodetector signals not two rings of detectors connected in parallel). The Board's finding of "numerous advantages associated [with] the parallel connections taught by Mendelson-2003" thus rests on Apple's expert's admittedly incorrect understanding. An expert's admittedly erroneous analysis is not substantial evidence.

The Board also suggested that two parallel-connected rings of detectors could "compensat[e] for the relative decrease in light that reaches the outer ring, which cannot be achieved with a single signal stream." Appx00108-00109; Appx00190; Appx00265-00266. But that finding presumes a POSITA would choose to create an inferior sensor with a far outer ring in the first place, even though—as the Board found—such a modification would result in a "relative decrease in light" for the far ring of detectors. *Id.* As discussed, a POSITA would not have been motivated to

make such a modification. *See supra* Sections VII.A.1-2. Thus, that a POSITA could take steps to "compensat[e]" for the inferior sensor created by the Board's combination is irrelevant because a POSITA would not have modified Aizawa's sensor to decrease signal strength in the first place. Moreover, the Board's proposal to "compensat[e]" for the problems created by its modification to Aizawa's sensor—including by adding an amplifier—would increase device complexity. Appx12952-12953 ¶115. An amplifier would merely attempt to amplify a weakened signal created by the Board's flawed combination and restore that signal to the same level as the detectors in Aizawa's single ring. *Id.*; *see also, e.g.,* Appx00114 ("in order to account for the disparate currents generated by the two rings, the rings would be separately wired with separate amplifiers"). Likewise, no evidence supports that the Board's "compensating" would actually solve the relative signal decrease created by the Board's erroneous combination, or provide a signal quality similar to Aizawa's existing approach that adds detectors to a single ring. Appx02493 ¶32.

The Board did not reconcile its conflicting findings, which alternately modify Aizawa's structure to allegedly increase signal strength (Appx00107-00108; Appx00188-00189; Appx00264-00265) yet produce a structure that requires further modifications to "compensat[e] for the relative decrease in light that reaches the outer ring" (Appx00108-00109; Appx00190; Appx00265-00266). Instead, the Board found that adding components "would have been a routine and conventional

design choice, within the level of ordinary skill in the art." Appx00114; Appx00195-00196; Appx00271. Regardless of whether a POSITA ***could*** have made the proposed changes, there would have been no motivation for a POSITA to do so. Lacking evidence of such a motivation, the Board improperly shifted the burden to Masimo, stating that neither Masimo nor its expert asserts "that adding a second amplifier would be beyond the level of skill in the art or would introduce any specific problems, beyond its mere addition." *Id*. But it was Apple's burden to show two separate rings of detectors would have been beneficial, not Masimo's burden to show an erroneous combination was impossible.

Indeed, Mendelson-2003 recommends connecting all of its detectors in parallel when constructing a sensor for physiological monitoring. Appx10232. In Mendelson-2003's system for laboratory testing, near and far rings are connected in parallel and the individual rings are connected to a hub, which allow measurements from just one ring of detectors or the other. Appx10230. But despite using this setup for its experiments, Mendelson-2003 teaches that a sensor design for physiological monitoring benefits from using ***one*** combined signal stream from ***all*** detectors. *See, e.g.*, Appx10232 (results show the "practical advantage gained by using a reflection sensor comprising a large ring-shaped PD area"; "experiments revealed that battery longevity could be extended considerably by employing a wide annular PD").

Mendelson-2003 provides no teachings that suggest its power testing system setup would be useful in a working physiological monitor.

The Board found that Mendelson-2003 "*simulates* a single ring by using two discrete rings." Appx00113-00114 (emphasis original); Appx00195 (emphasis original); Appx00270 (emphasis original). But that finding explains why Mendelson-2003 concludes that a physiological sensor design should connect all detectors together to form one signal stream. Appx10232. As Mendelson-2003 explains: "we found that by combining both PD sets to simulate a single large PD area, it is possible to further reduce the driving currents of the LEDs." *Id*. Connecting all detectors together is mutually exclusive with maintaining two separate signals from separately connected detector rings. Indeed, Mendelson's other work eliminates any confusion about Mendelson-2003's teaching. When Mendelson designed a "wearable, reflectance pulse oximeter" (and not a laboratory testing setup), he used exactly the approach recommended in Mendelson-2003 "to reduce power consumption" and constructed a single stream from one large detector or multiple detectors connected in parallel. Appx02551; *see also* Appx02549 (Fig. 2, illustrating path for one signal stream from photodiode).

In addition to the Board's finding contradicting Mendelson-2003's teaching that a POSITA should use one signal and not two separate signals, the Board's finding also conflicts with the Board's own findings about Aizawa. Masimo argued

to the Board that Aizawa's approach requires monitoring individual detector signals, not one signal from detectors connected in parallel. Appx07598; Appx15078-15079; Appx21027. The Board disagreed and found that Aizawa's sensor connects all detectors in parallel. Appx00111-00112; Appx00193; Appx00268-00269. The Board reasoned that Aizawa nowhere suggests that Aizawa's sensor could separately monitor multiple signals "and there is certainly no need to do so if its sensors [*sic* detectors] are connected in parallel." *Id*. Despite the Board finding that Aizawa connects ***all*** detectors in parallel (as recommended by Mendelson-2003), and that Aizawa's sensor was not even "capable" of monitoring separate signal streams, the Board's proposed modifications split Aizawa's detectors into two signal streams. Appx00108-00109; Appx00190; Appx00265-00266. The Board never explained why Aizawa's sensor alone would be incapable of "somehow monitoring the signals of each photodetector," but the Board's combination was somehow capable of separately monitoring the signals from each of two rings of detectors. The Board's conflicting findings further underscore its hindsight reconstruction of the claims.

Accordingly, the Board's finding that a POSITA would have modified Aizawa's sensor to use two signal streams from two sets of parallel-connected detectors is erroneous and unsupported by substantial evidence. This error alone requires that the Court reverse the Board's obviousness holdings for all claims in IPR1716/1733/1737.

B. The Board Made Multiple Errors In Finding The Aizawa-Ohsaki Combination Would Improve Detection Efficiency

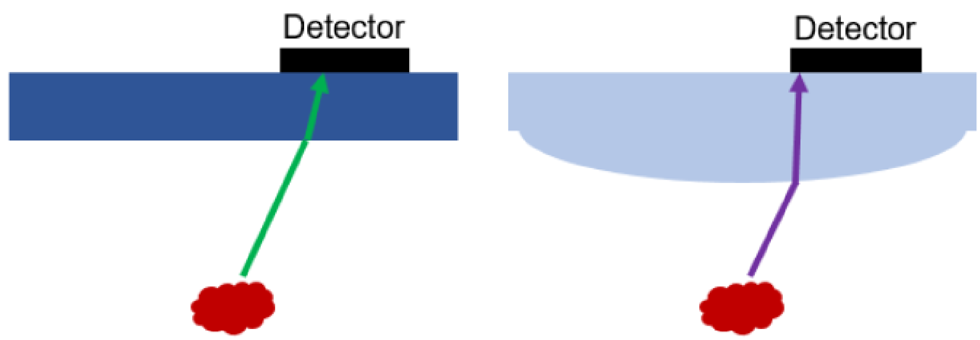
The Board found in IPR1713/1716/1733/1737 that Ohsaki would have motivated a POSITA to add a convex surface to "Aizawa's flat cover" to "improve detection efficiency." Appx00129; Appx00208; *see also* Appx00035; Appx00285-00286. The Board's finding is erroneous and unsupported by substantial evidence. This is a distinct error that justifies reversal of the Board's unpatentability holdings for all claims.

1. The Board Erred By Failing To Reconcile Apple's Admissions

The Board found that a convex cover would not "condense light away from Aizawa's peripheral detectors" and "decrease signal strength." Appx00045; Appx00137; Appx00217; Appx00294-00295. But the Board did not reconcile this finding with Apple's numerous admissions that a POSITA would believe a convex surface condenses light ***centrally***, and thus away from peripherally located detectors. Appx05465-05466 83:15-84:2; Appx05468-05469 86:19-87:1.

Apple and its expert asserted: (1) "the incoming light is 'condensed' toward the center," (2) the combination's convex surface would result in "more light in the center than at the outer edge," and (3) "that's because light's being directed towards the center and away from the edge…." Appx06386-06387; Appx06525-06526

¶119; Appx05586 204:1-20. Apple's expert even illustrated that a convex cover (below right) redirects light centrally compared to a flat cover (below left):



Apple's Illustrations of Light-Redirection (Appx06526)

Apple's expert explained that the above-right illustration shows "the incoming light is 'condensed' toward the center." Appx06525-06526 ¶119.

The Board dismissed this by reasoning that Apple's expert had just addressed "a single ray of light" rather than "the aggregate effect on *all* light that travels through the convex surface." Appx00048 (emphasis original); Appx00141 (emphasis original); Appx00220-00221 (emphasis original); Appx00298 (emphasis original). However, the claim language addressed by Apple's expert required that "the light permeable cover is configured to reduce a ***mean path length*** of light traveling to the at least four detectors." Appx06525. Under the Board's interpretation, Apple's expert presented no analysis of how the illustration demonstrates a reduced path length of light on ***average***. Indeed, Apple's expert

agreed that "a mean path length mean[s] the same as an average patent [*sic* path] length." Appx05580 198:6-11.

Apple's admissions should have been fatal to all combinations. ***Every*** combination in all four IPRs has peripheral detectors arrayed around a centrally located emitter. Appx05338 ¶79; Appx12930-12931 ¶86; Appx18879-18880 ¶86; Appx24683-24684 ¶86. As Masimo's expert explained, consistent with Apple's admissions and a POSITA's understanding of how a convex surface impacts light, a POSITA would have believed that the Board's convex surface would direct light ***away*** from the peripherally located detectors, ***decreasing*** light collection and degrading sensor performance. Appx05338-05344 ¶¶79-88; Appx12930-12939 ¶¶86-97; Appx18879-18888 ¶¶86-97; Appx24683-24692 ¶¶86-97.

The Board's failure to reconcile Apple's admissions with the Board's decisions justifies reversal or remand. *See Cook Grp. v. Bos. Sci. Scimed, Inc.,* 809 F. App'x 990, 999 (Fed. Cir. 2020) (nonprecedential) ("The Board erred in refusing to consider [petitioner's] admission[s] when it was weighing the evidence…."); *PPC Broadband, Inc. v. Iancu,* 739 F. App'x 615, 622-23 (Fed. Cir. 2018) (nonprecedential) (vacating obviousness where Board failed to address expert's admissions). "The Board's selective weighing of the record evidence does not pass muster under the APA. Just as it may not short-cut its legal analysis, the Board may not short-cut its consideration of the factual record before it." *Applications in*

Internet Time, LLC v. RPX Corp., 897 F.3d 1336, 1353 (Fed. Cir. 2018). "[A]n agency's refusal to consider evidence bearing on the issue before it is, by definition, arbitrary and capricious…." *Aqua Prods. v. Matal*, 872 F.3d 1290, 1325-26 (Fed. Cir. 2017).

2. The Board's Adoption Of The "Additional Light Capture" Theory Is Unsupported By Substantial Evidence

Rather than reconcile Apple's numerous admissions, the Board adopted one of the many new theories Apple asserted after Apple discovered the flaw in its combinations. Apple's many new theories included that: (1) light would increase at certain locations (including somehow at least at the detectors), Appx05523-05525 141:22-143:5; (2) light would increase everywhere under the convex surface, Appx05546 164:8-16; (3) the convex surface would capture more light overall than a flat surface (the "additional light-capture" theory), Appx05586-05587 204:21-205:12; and (4) the path of light is "reversible" in a physiological sensor such that switching emitters and detectors would have no impact on optics (the "reversibility" theory), Appx03607-03611 ¶¶35-43, Appx12049-12054 ¶¶35-43, Appx17736-17740 ¶¶35-43, Appx23542-23546 ¶¶35-43. In related IPR proceedings, Apple also argued another new theory—which the Board adopted in those related IPR proceedings—that: (5) light concentration would improve at Aizawa's detectors because of where the illustrated "curvature of [Apple's] lens surface is the greatest" (the "greatest curvature" theory). *See, e.g., Apple Inc. v. Masimo Corp.*, No.

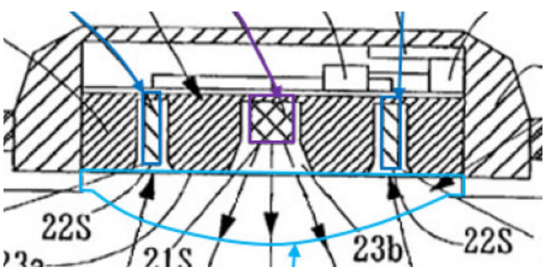
IPR2020-01520, 2022 WL 557896, at *21 (P.T.A.B. Feb. 23, 2022). Apple did not even bother arguing the ridiculous "greatest curvature" theory in these proceedings.

None of these theories were in Apple's petitions, and the theories contradict the cited art and Apple's expert's initial position. The Board nonetheless adopted the "additional light-capture" theory without elaboration, merely citing paragraphs of Apple's expert's ***reply*** declaration.[5] Appx00139 (citing Appx12056-12059 ¶¶49, 53); Appx00219 (citing Appx17743-17745 ¶¶49, 53); Appx00296-00297 (citing Appx23547-23549 ¶¶46-49); Appx00046-00047 (citing Appx03613-03615 ¶¶46-49). The Board premised its adoption of the "additional light-capture" theory on the Board's understanding that "a [POSITA] would have understood that 'Ohsaki's convex cover provides a slight refracting effect, such that ***light rays that otherwise would have missed the detection area*** are instead directed toward that area as they pass through the interface provided by the cover." Appx00032; Appx00125; Appx00205; Appx00282. Although Apple's expert testified, "I'm sure there are

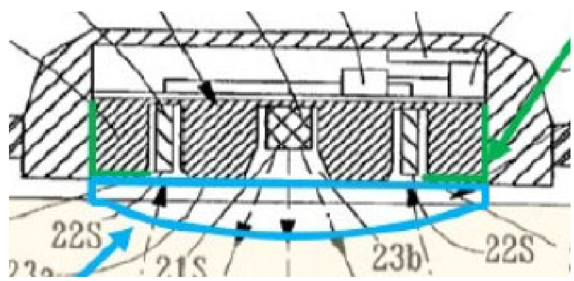
[5] The Board also generally identified pages in Apple's petitions to suggest that Apple's "Reply presents more argument and evidence in support of the same theory for obviousness presented in the Petition." *See, e.g.*, Appx00049 ("*Compare* Pet. 19–23, *with* Pet. [*sic*] Reply 20–32"). Yet a review of those pages exposes how Apple's petition nowhere mentions capturing more light overall with a convex surface than a flat surface. *See, e.g.,* Appx01233-01237. Rather than support the Board's reasoning, those pages erroneously state "[a] POSITA would have recognized that with a flat plate 6, Aizawa's wrist-worn PMD would have slipped along the user's wrist, resulting in variations in the light detected by the photodetectors, as explained by Ohsaki." Appx01234. *See infra* Section VII.C.

journal articles that describe the effect," he could not identify any when asked (Appx05677 295:5-11), and the Board cites none in its findings. Ohsaki discloses nothing about its convex surface capturing additional light rays.

The Board also never reconciled the "additional light-capture" theory with Apple's admissions that refute the theory. Apple's expert explained that some light rays "that would have hit the detectors" with a flat surface are "refracted away from the detectors" by a convex surface. Appx06613-06615 19:16-21:8. The Board never explained how a POSITA would balance the loss of refracted-away light rays against some additional light capture benefit. This lack of explanation is particularly problematic because, as illustrated below, Apple significantly varied the shape of its convex surface from its petition to reply in the same IPR proceedings.



Apple's Large Convex Surface in Petition in IPR1713 (Appx01237)



Apple's Small Convex Surface in Reply in IPR1713 (Appx01605)

The Board's reconfiguration of Aizawa's single ring into two separate rings further complicates the Board's already convoluted analysis. *See supra* Section VII.A. Apple's expert acknowledged that light decreases exponentially when moving away from the emitter. Appx06643-06644 49:1-50:13; Appx06651 57:10-22. The Board failed to articulate how a POSITA would balance the exponential

decrease in signal at its far ring of detectors with the "additional light-capture" theory. This failure is particularly problematic when the Board never identified whether distant or close additional light rays would be captured via the "additional light-capture" theory. And the Board never explained how a convex surface could somehow beneficially redirect light both somewhat centrally to the near ring of detectors and somewhat peripherally to the far ring of detectors.

The Board then rejected Masimo's expert's testimony that a convex surface "condenses light passing through it towards the center of the sensor and away from the periphery." Appx00047; Appx00297; *see also* Appx00139-00140; Appx00219-00220. But Apple's own expert testified that light passing through a convex surface condenses towards the center of the underlying sensor. *See supra* Section VII.B.1. The Board's analysis did not reconcile those opinions with its decisions.

The Board also rejected Masimo's expert's opinions as purportedly "premised upon the behavior of collimated and perpendicular light as depicted in Figure 14B of the challenged patent." Appx00047; Appx00139-00140; Appx00219-00220; Appx00297. That finding is unsupported by substantial evidence. Masimo's expert did not limit his opinions to just "collimated and perpendicular light" as the Board found. Instead, Masimo's expert testified that a POSITA "viewing Figure 14B in the context of the specification, would understand that it represents light from the measurement site that could include ***all kinds of light***, including collimated or

***diffused light*.**" Appx04511 57:8-13. As Masimo's expert explained, a POSITA would have generally understood that a convex surface redirects light centrally compared to a flat surface. *Id.*; *see also* Appx05342-05344 ¶¶86-87; Appx12935-12937 ¶¶93-94; Appx18884-18886 ¶¶93-94; Appx24688-24690 ¶¶93-94. The Board is thus wrong that Masimo's expert's testimony was "premised" on the behavior of collimated light. Moreover, the distinction between collimated and diffuse light is nowhere in Apple's petition filings, and the Board instead relies on Apple's reply filings and Apple's expert's deposition testimony.

The Board complained that Masimo's expert "does not explain how light would behave when approaching the sensor from various angles, as it would after being reflected by tissue." Appx00047; Appx00139-00140; Appx00219; Appx00297. That is incorrect. Despite Apple nowhere addressing "how light would behave when approaching the sensor from various angles" in Apple's petition filings, Masimo's expert testified that a POSITA would understand that "[w]ithout qualifying any particular type of angle, [light rays] would generally be condensed or focused towards the center." Appx04513-04514 59:11-60:2.

The Board also found that "even if [Masimo] is correct that [Masimo's] Figure 14B depicts light condensing toward the center, this is not dispositive to the proposed modification, because light reflected by a user's tissue is scattered and random, and is not collimated and perpendicular as shown in Figure 14B." Appx00047;

Appx00139-00140; Appx00219-00220; Appx00297. But Masimo's specification never distinguishes between collimated and perpendicular light in connection with Figure 14B or otherwise. Appx00406 36:12-32. There was no dispute that Masimo's specification addressed a sensor that would receive scattered—not collimated—light from a measurement site. Appx04489-04490 35:17-36:4; Appx05552 170:4-7; Appx00399 21:16-25. Masimo's Figure 14B illustrates a general principle: that incoming light passing through a convex surface would be redirected centrally. The Board's finding that Figure 14B only addressed a particular directionality of light rays irrelevant to Masimo's patent was erroneous and unsupported by substantial evidence.

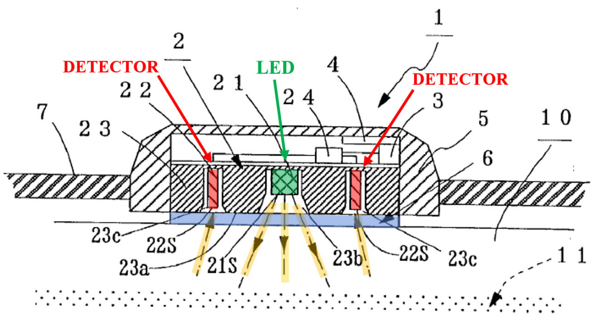
The Board's findings about the relevant level of ordinary skill further undermine its decisions. The Board found that a POSITA would have "a Bachelor of Science degree in an academic discipline emphasizing the design of electrical, computer, or software technologies, in combination with training or at least one to two years of related work experience with capture and processing of data or information." Appx00013; Appx00087; Appx00168-00169; Appx00243-00244. The Board also stated "[a]dditional education in a relevant field or industry experience may compensate for one of the other aspects of the ... characteristics stated above." Appx00013; *see also* Appx00087; Appx00168-00169; Appx00243-00244. This description of a POSITA's knowledge includes ***no*** specialized

education or work experience in optics, much less optics for physiological monitoring.

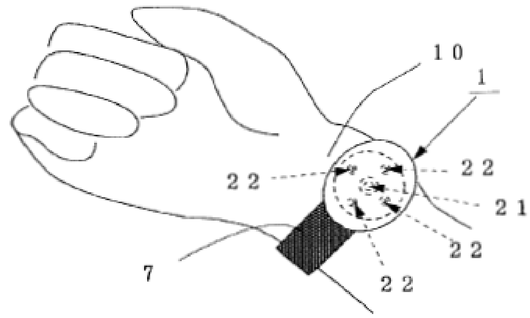
The Board nonetheless found that a POSITA would know the "additional light-capture" theory. Yet no cited reference teaches the "additional light-capture" theory, much less show a POSITA with ***no*** optics training would be familiar with the theory. Any such concept was also apparently unknown to Apple and its expert when Apple filed its petitions, which nowhere mention the theory. Apple and its expert instead relied on the straightforward understanding that a protrusion acts as a lens and concentrates light towards the ***center***. *See, e.g.,* Appx05586 204:1-20; Appx05465-05466 83:15-84:2; Appx05468-05469 86:19-87:1. Despite decades of lens research cited by Apple, the Board and Apple cited no example where a POSITA increased light in a physiological sensor at peripheral detectors under a single protrusion. *See Brand v. Miller*, 487 F.3d 862, 869-70 (Fed. Cir. 2007) ("[T]he path that the Board determined that a skilled artisan would follow has, so far as the record reflects, never been followed.").

The Board's finding also contradicts the express disclosure of Aizawa. Aizawa discloses that "a transparent ***plate***-like member" is what "makes it possible to improve adhesion between the sensor and the wrist and thereby further ***improve the detection efficiency*** of pulse waves." Appx02492 ¶[0013]. Aizawa's sensor (below) positions narrow tapered openings over its detectors to collect light reflected

from arteries and uses multiple opening/detectors to ensure at least one detector is near an artery during monitoring. Appx02493 ¶¶[0022]-[0027].



Aizawa Fig. 1B
(color added, Appx02489)



Aizawa Fig. 2
(Appx02490)

Placing a single protrusion over ***all*** detectors would fundamentally disrupt Aizawa's optics by redirecting light centrally and away from the narrow openings. Appx05342-05344 ¶¶86-87; Appx12935-12937 ¶¶93-94; Appx18884-18886 ¶¶93-94; Appx24688-24690 ¶¶93-94. The Board identified no evidence explaining why a POSITA would have disregarded Aizawa's specific disclosure to use a ***flat*** plate for improved detection efficiency.

Moreover, the Board never explained why a POSITA applying the "additional light capture" theory would arrive at the claimed ***single*** protrusion over multiple peripheral detectors in a physiological sensor. Indeed, the examiners cited art that placed a convex surface over each detector (illustrated below[6]):

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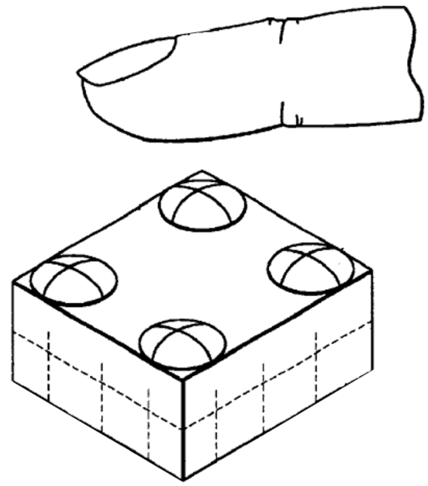
[6] Adapted from Chaiken (U.S. Patent No. 6,223,063).



In the reasons for allowance, the examiners, who collectively have decades of experience examining applications in the field, found individual protrusions over individual detectors did not disclose or suggest Masimo's approach of a ***single*** protrusion over ***multiple*** detectors. Appx01960-01962; Appx08349-08352; Appx15781-15784; Appx21704-21706. No evidence explains why the "additional light-capture" theory would lead a POSITA to a ***single*** protrusion over multiple detectors. This is particularly true for the Board's combinations that would require a single protrusion to simultaneously direct light to both near and far rings of detectors. *See supra* Section VII.A. "Merely stating that a particular placement of an element is a design choice does not make it obvious. The Board must offer a reason for why a person of ordinary skill in the art would have made the specific design choice." *Cutsforth, Inc. v. MotivePower, Inc.*, 636 F. App'x 575, 578 (Fed. Cir. 2016) (nonprecedential). The Board erred by failing to do so.

It was the inventors who discovered the unexpected benefit of a single protrusion over multiple detectors in a physiological sensor. Appx00398 20:27-29. The Board identified no prior art that teaches such a configuration.

C. The Board Made Multiple Errors In Finding The Aizawa-Ohsaki Combination Would Improve Adhesion

The Board found Ohsaki would have motivated a POSITA to add a convex surface to Aizawa's sensor to improve adhesion. Appx00035; Appx00129; Appx00208; Appx00285-00286. Even if such a motivation existed, however, nothing showed this motivation would have led a POSITA to create an optically ***flawed*** sensor that directs light ***away*** from its peripheral detectors. *See supra* Section VII.B.

1. The Board Erred By Failing To Reconcile Its Decisions With Ohsaki's "Tendency To Slip Off" Disclosure

Regardless, the Board erred by finding a motivation to combine based on "adhesion" without reconciling that finding with Ohsaki's disclosure that its convex surface has a "tendency to ***slip off***" at Aizawa's palm-side measurement location. Appx02546 ¶[0023]; s*ee Chemours Co. v. Daikin Indus.*, 4 F.4th 1370, 1376 (Fed. Cir. 2021) (reversing where Board did not "adequately grapple" with why POSITA would have made modification given prior art's express disclosure); *Polaris Indus. v. Arctic Cat, Inc.,* 882 F.3d 1056, 1069 (Fed. Cir. 2018) ("a reference 'must [be] considered for all it taught, [including] disclosures that diverged and taught away

from the invention at hand'"). "[T]he Board may not short-cut its consideration of the factual record before it." *RPX*, 897 F.3d at 1353.

Rather than consider Ohsaki's "tendency to slip off" disclosure in paragraph 23 (Appx02546 ¶[0023]), the Board broadly interpreted Ohsaki's paragraph 25 as supporting that any convex surface would generally provide increased adhesion compared to a flat surface (*Id*. ¶[0025]). But Ohsaki's paragraph 25 compares the performance of a convex surface to a flat surface on the wrist's backside (i.e., ***watch side***), as shown in Figures 4A-4B. *Id*.; Appx05990-05991 156:18-157:4; Appx05331-05333 ¶¶72-73; Appx12924-12926 ¶¶79-80; Appx18873-18875 ¶¶79-80; Appx24677-24679 ¶¶79-80. Nothing in Ohsaki teaches that its convex surface provided any adhesion benefit over a flat surface at any ***other*** location. Indeed, the Board relied on Apple's expert's misreading of Aizawa as evidence that a flat surface would have slipped at the wrist's palm-side. *See* Appx00035 (citing Appx02366-02367 ¶67). But Apple's expert's assertion that "with a flat plate 6, Aizawa's wristworn [sensor] would have slipped along the user's wrist" conflicts with Aizawa's express disclosure that its flat surface actually "improve[s] adhesion." Appx02492 ¶[0013].

Ohsaki illustrates with Figures 3A-3B (below) undesirable variation in a sensor signal when using its protrusion on the wrist's palm-side, which is where Aizawa's sensor must be placed to be close to arteries. Appx02544 Figs. 3A-3B; Appx02546 ¶¶[0023]-[0024]; Appx02488-02489 Abstract, Figs. 1A-1B; Appx02492-02493 ¶¶[0013], [0023], [0026]; Appx05323-05326 ¶¶61-64.

FIG. 3A

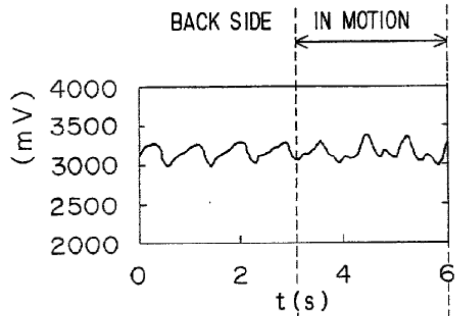
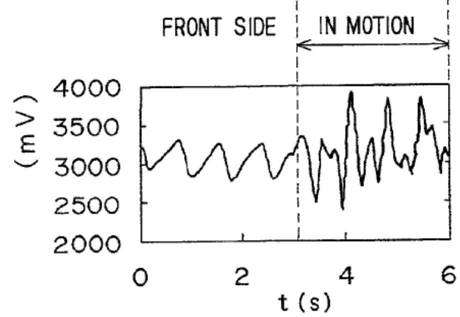
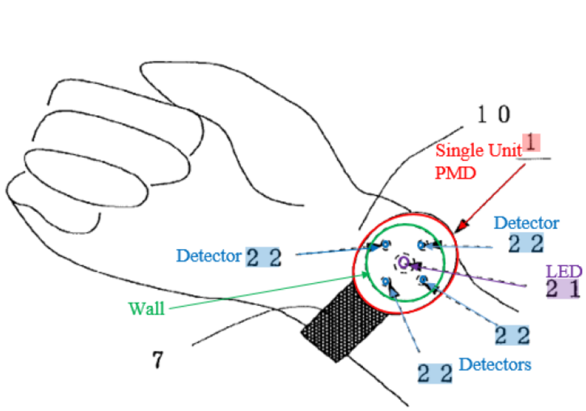


FIG. 3B

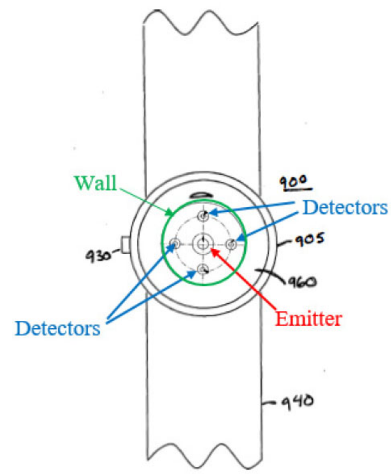


Ohsaki Figs. 3A (protrusion on backhand side), 3B (protrusion on palm-side)

The Board also found that "Petitioner's proposed modification does not dictate any particular placement, whether on the palm side or back side of the wrist." Appx00042-00043; Appx00135; Appx00215; Appx00292-00293. But that finding disregards Apple's actual combination and cited art. Apple illustrated that its combination is placed on the wrist's palm-side like Aizawa's sensor:



Apple's Combination Illustration (Appx01282-01284)



Apple's Combination Illustration (Appx01282-01284)

Apple additionally asserted "a POSITA would have found it obvious to modify Aizawa's sensor to include a cover having a protruding convex surface, improving adhesion between a surface of the sensor and the user's wrist." Appx01234. Apple explained that "[d]oing so would have amounted to nothing more than the use of a known technique to improve similar devices in the same way and combining prior art elements according to known methods to yield predictable results." *Id*.

The Board further summarized in its decisions Apple's reply argument as "Ohsaki's disclosure that a convex surface suppresses variation in reflected light would have motivated an artisan to add such a surface to Aizawa to improve detection efficiency of that sensor when placed on the ***palm side***." Appx00030-00031; *see also* Appx00041 (the Board agreeing that "Ohsaki's teaching of a convex surface would have motivated a [POSITA] to add such a surface to Aizawa's circular-shaped sensor…."); Appx00130-00131 ("incorporating Ohsaki's convex

surface is simply improving Aizawa-Mendelson-2003's transparent plate 6....”). There was no dispute that Aizawa's sensor with a flat plate was designed for the wrist's ***palm-side***. *See* Appx00043 (the Board crediting Apple's expert testimony that a POSITA “would have understood from Ohsaki that a convex protrusion will help prevent slippage, even in the context of Aizawa's sensor”). And whatever the Board's combination, Aizawa's sensor monitors arteries that Aizawa illustrates are accessible on the wrist's palm-side. Appx02488-02489 Abstract, Figs. 1A-1B; Appx02492-02493 ¶¶[0013], [0023], [0026]; Appx05323-05326 ¶¶61-64. “What matters is the path that the person of ordinary skill in the art would have followed, as evidenced by the pertinent prior art,” *Univ. of Strathclyde v. Clear-Vu Lighting LLC*, 17 F.4th 155, 165 (Fed. Cir. 2021), not Apple's description of its own combination, using the claims as a guide.

The Board also found that the combinations would at least work and provide some benefit “if the user is at rest.'” Appx00043; Appx00135-00136; Appx00215; Appx00293. But the Board's motivation to combine was based on Ohsaki's disclosure that its convex surface may perform better than a flat surface in ***motion***. Appx00036-00037 (citing Appx02546 ¶[0025] (if board has “flat surface,” pulse wave is “adversely affected” by “movement”)); Appx00129-00130; Appx00209-00210; Appx00286-00287. Nothing in Ohsaki suggests its convex surface provides any adhesion benefit when a user is at rest.

The Board additionally found the alleged improved adhesion from Ohsaki's convex surface would have also improved Aizawa's signal strength and detection efficiency. Appx00035-00036; Appx00129; Appx00208-00209; Appx00285-00286. As discussed, however, a POSITA would not have believed Ohsaki's convex surface would improve adhesion at Aizawa's palm-side location in the first place, much less provided any additional alleged benefit flowing from improved adhesion. Moreover, Ohsaki nowhere states that its convex surface improves "signal strength." Appx02546 ¶¶[0023]-[0025]. The Board repeatedly treated "signal strength" as synonymous with "detection efficiency," without explaining why these concepts are purportedly the same. The only reference that mentions either term is Aizawa, which expressly teaches its ***flat*** plate improves detection efficiency. Appx02492 ¶[0013]. The Board identified no reason Aizawa's flat plate, disclosed as already providing improved detection efficiency, would be insufficient and should be replaced with a convex surface that Ohsaki says slips at Aizawa's palm-side measurement location.

2. The Board Erred By Adopting Its Own Theory For The First Time In Its Decisions

Even if Ohsaki could be interpreted as disclosing that its convex surface provides improved adhesion, Aizawa explains that its sensor already obtains improved adhesion with its ***flat*** surface. Appx02492 ¶[0013]. Aizawa discloses that "a transparent ***plate***-like member" is what "makes it possible to improve adhesion

between the sensor and the wrist and thereby further improve the detection efficiency of pulse waves." *Id*. Indeed, Aizawa—and not Ohsaki—mentions "adhesion."

The Board discarded Aizawa's teaching that its flat cover provides improved adhesion. The Board instead adopted its own theory for the first time in the decisions: that Aizawa's "improved adhesion is provided by the acrylic material of plate 6, not the shape of the surface of the plate." Appx00044; Appx00137; Appx00216-00217; Appx00294. But the "Board must base its decision on arguments that were advanced by a party, and to which the opposing party was given a chance to respond." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1381 (Fed. Cir. 2016).

Apple's own expert testified that (1) Aizawa's "plate is described as a plate-like member. It doesn't explicitly require the use of acrylic" (Appx05516 134:9-14); and (2) a POSITA would understand you can get Aizawa's benefit by using acrylic ***or*** "other" materials (Appx05514-05515 132:19-133:9). Aizawa's disclosure itself makes clear that Aizawa's flat plate, not its acrylic material, improves adhesion. Appx02492 ¶[0013]. The Board's new theory thus contradicted Aizawa's teachings and Apple's expert's testimony.

3. <u>The Board Erred In Finding A POSITA Would Add A Convex Surface For Protection</u>

The Board also found that a POSITA would have been motivated to add a convex surface to Aizawa's sensor to provide protection. Appx00035; Appx00129;

Appx00208; Appx00285-00286. But there was no dispute that Aizawa's flat plate already provided protection. Appx02489 Fig. 1B. Indeed, the Board found: "We are persuaded that adding a convex cover, such as that taught by Ohsaki, would also protect the sensor's internal components ***in a manner similar to*** Aizawa's flat acrylic plate." Appx00049-00050; Appx00142; Appx00221-00222; Appx00299-00300. The Board further acknowledged "[t]hat a convex cover may be ***more*** prone to ***scratches*** than Aizawa's flat cover…." *Id*. The Board reasoned that scratching "is one of numerous tradeoffs that a [POSITA] would consider in determining whether the benefits of increased adhesion, signal strength, and protection outweigh the potential for a scratched cover." *Id*. But that analysis uses the claims as a guide, and sidesteps the relevant question: whether a POSITA seeking to protect Aizawa's sensor elements would have been motivated to change Aizawa's flat cover (which already provided protection) to a shape prone to scratches and slipping. The Board's decisions contain no answer—only hindsight. *See Kinetic Concepts, Inc. v. Smith & Nephew, Inc*., 688 F.3d 1342, 1369 (Fed. Cir. 2012).

D. The Board's Holdings That Particular Protrusion Heights Would Have Been Obvious Are Erroneous And Unsupported By Substantial Evidence

Claims 16 and 17 of the '564 patent (in IPR1713, Appx00410-00411), claims 13, 17, and 29 of the '194 patent (in IPR1716, Appx00514-00515), and claims 9 and 15 of the '195 patent (in IPR1733, Appx00618-00619) recite specific protrusion height ranges of greater than 1 or 2 millimeters and less than 3 millimeters over the

detectors, which the inventors found were surprisingly effective (Appx00398 20:29-33). The Board acknowledged ***none*** of the Board's combinations of references teach the claimed range and that "Petitioner relies upon the knowledge, ability, and creativity of a [POSITA]." Appx00056; Appx00150; Appx00227. But "[o]rdinary creativity" cannot satisfy "a limitation missing from the prior art references specified." *DSS Tech. Mgmt., Inc. v. Apple Inc.*, 885 F.3d 1367, 1377 (Fed. Cir. 2018).

The Board nonetheless found Masimo's protrusion height ranges obvious, stating that "a finite number of solutions existed…." Appx0055; Appx00149; Appx00226. But neither the Board nor Apple's expert identified any purported "finite number" of protrusion heights or any evidence that the claimed heights would have improved adhesion—the motivation for adding Ohsaki's protrusion to Aizawa's sensor in the first place. Apple's expert testified he did not ***know*** Ohsaki's shape or dimensions. *See* Appx05904-05906 70:20-72:20 (unable to "assert that the shape [of Ohsaki's board] was necessarily circular or square or rectangular"); Appx05929 95:8-18; Appx05939-05940 105:1-106:5 (Ohsaki "doesn't ever state ***dimensions***, thicknesses, things like that"); Appx05945 111:3-10; Appx05964-05965 130:13-131:16 ("there's nothing that tells me anything in particular about the shape or ***dimensions*** of the cover, this translucent convex cover"); *see also* Appx05874-05875 40:7-41:16; Appx05882-05883 48:19-49:21; Appx05891-05892

57:18-58:16; Appx05894-05895 60:4-17, 60:18-61:21. Apple's expert's complete ignorance of Ohsaki's shape or dimensions confirms the Board's combination does not teach a "finite number of solutions," let alone suggest that the claimed specific protrusion height ranges (*e.g.*, 2-3 mm) would be one of those solutions.

Apple's expert also emphasized the complexity of designing a physiological sensor, which depends on numerous choices and considerations, including the optics and intended sensor location. Appx05692-05693 310:18-311:9; *see also* Appx05482-05483 100:17-101:18; Appx05479 97:11-21; Appx05536 154:4-7. Apple's expert testified there is a "***universe*** of possible design choices." Appx05482-05483 100:17-101:6.

"Merely stating that a particular placement of an element is a design choice," as the Board did here, "does not make it obvious. The Board must offer a reason for why a person of ordinary skill in the art would have made the specific design choice." *Cutsforth*, 636 F. App'x at 578. One may not "simply retrace[] the path of the inventor with hindsight, discount[] the number and complexity of the alternatives, and conclude[] that the invention ... was obvious." *Ortho-McNeil Pharm., Inc. v. Mylan Labs., Inc.*, 520 F.3d 1358, 1364 (Fed. Cir. 2008).

The Board additionally found that "the record does not support that any new and unexpected results were achieved at the claimed height greater than 2 millimeters and less than 3 millimeters." Appx00055-00056; Appx00149-00150;

Appx00227. But the specification itself reports that a cover with the claimed heights improve signal strength by an order of magnitude—a result suggested nowhere in any cited art. *See, e.g.*, Appx00398 20:29-33; Appx00336 Fig. 5. Masimo's expert confirmed that "a convex bump of about 1 mm to about 3 mm in height and about 10 mm^2 to about 60 mm^2 was found to help signal strength by about an order of magnitude versus other shapes." Appx05347-05348 ¶93; Appx12954-12955 ¶120; Appx18903-18904 ¶120. Masimo's expert explained that such an improvement in signal strength "can dramatically increase the accuracy of the measurements." *Id.*

In IPR1716/1733, the Board did not even address the dramatic increase in signal strength from the claimed range. In IPR1713, the Board noted the issue, but discarded the evidence of substantially improved signal strength. The Board instead asserted that "[a]s for the alleged benefit at the specific ranges described in [Masimo's] Specification, we agree with Petitioner that other considerations are relevant, such as user comfort and other attributes, that would have motivated a person of ordinary skill in the art to design within the claimed ranges." Appx00056.

The Board's only cited evidence, however, is Apple's attorney's argument from the hearing (Appx01836 80:7-14) and an explanation from Masimo's specification that the protrusion's area can be selected "for different sized tissue for an adult, an adolescent, or infant, or other considerations" (Appx00400 23:43-50). The Board's suggestion that other designs were possible does not properly account

for the previously unknown dramatic improvement in signal strength stemming from a cover with the claimed protrusion height range over multiple detectors. "Objective indicia of nonobviousness ***must be considered*** in every case where present." *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016). Yet the Board speculates that "other considerations" would have led a skilled artisan to exactly the claimed specific protrusion height ranges (*e.g.*, 2-3 mm) positioned over multiple detectors in a physiological sensor and ignores the improvements discovered by the inventors. The dramatic increase in signal strength further confirms the claimed ranges would have been nonobvious.

VIII. CONCLUSION

For all the reasons above, this Court should reverse the Board's obviousness holdings. The Board's findings in IPR1716/1733/1737 would have a POSITA ignore (1) Mendelson-2003's teaching that a far ring of detectors decreases signal strength and increases power consumption relative to a single near ring of detectors; (2) Mendelson-2003's teaching that in practice all detectors in a physiological sensor should be connected in parallel to form a single large detector; and (3) Apple's expert's admission that a single ring of detectors would increase signal strength and reduce power consumption as compared to an added far ring of detectors. In addition, the Board's findings in IPR1713/1716/1733/1737 would have a POSITA ignore (1) the straightforward understanding acknowledged by Apple and its expert

that a convex surface condenses light centrally; (2) Ohsaki's teaching that its convex surface is prone to slip off when placed on the palm-side; and (3) Aizawa's teaching that a flat plate provides improved adhesion and detection efficiency at the wrist's palm-side.

Respectfully submitted,

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Dated: December 12, 2022

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CERTIFICATE OF COMPLIANCE

1. This brief complies with the type-volume limitation of Federal Rule of Appellate Procedure 32(a). This brief contains 11,140 words, excluding the parts of the brief exempt by Federal Rule of Appellate Procedure 32(f) and Federal Circuit Rule 32(b)(2).

2. This brief complies with the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5) and the type style requirements of Federal Rule of Appellate Procedure 32(a)(6). This brief has been prepared in a proportionally spaced typeface using Microsoft Word in 14-point font Times New Roman.

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